

CLAIMS

I Claim:

1. A gas fired heating apparatus comprising:
 - a) a plurality of burners, said burners grouped into at least first and second groups;
 - b) a source of a combustible gas and a modulating gas control valve connected to said first group of burners, said modulating control valve controlling the flow of combustible gas from said source to said first group of burners;
 - c) a source of combustible gas and a gas control valve associated with said second group of burners, said gas control valve operative to control the flow of gas from said source to said second group of burners;
 - d) a heat exchange tube associated with each burner and having an inlet and an outlet, said associated burner firing into an inlet of said associated heat exchange tube;
 - e) a collector chamber communicating with outlets of said heat exchange tubes;
 - f) said collector chamber divided into sections by a baffle member, one of said sections communicating with the outlets of heat exchange tubes associated with the first group of burners, another section of said collector chamber communicating with the outlets of heat exchange tubes associated with said second group of burners; and,
 - g) an induced draft blower concurrently communicating with said sections of said collector chamber.
2. The apparatus of claim 1 wherein said induced draft blower is a two speed blower.
3. The apparatus of claim 1 wherein said induced draft blower is a variable speed blower.
4. The apparatus of claim 1 wherein said each burner of said first group have a port loading that enables each of said burners of said first group to operate at 1/4 of its maximum rated capacity.

5. The apparatus of claim 1 further including a secondary air plate disposed between an output end of said burners of said first group and the inlets of said heat exchange tubes associated with said burners of said first group, said secondary air plate spaced a predetermined distance from said inlets of said associated heat exchange tubes, thereby defining a path of secondary air between said plate and said tube inlets.

6. The apparatus of claim 5 wherein said path of secondary air is substantially orthogonal to an axis of an associated burner.

7. The apparatus of claim 6 further including a secondary air blocking member for restricting the flow of secondary air along said associated burner.

8. The apparatus of claim 7 wherein said baffle plate is offset in said collector box such that said collector box sections are not equal in size.

9. A method of operating a duct-type furnace, comprising the steps of:

- a) providing a plurality of burners arranged in at least two groups, each group having its own gas control valve connected to a source of combustible gas;
- b) providing a plurality of heat exchange tubes associated with said burners, said heat exchange tubes having inlets and outlets;
- c) providing a collector communicating with said tube outlets and divided into first and second collector sections;
- d) communicating said collector sections concurrently with an inlet to an induced draft blower;
- e) firing one group of burners while deactivating the burners of the other group in order to provide a substantially 50% output for said furnace; and,
- f) modulating the gas output to said one group of burners to provide a 4:1 turndown ratio for said one group of burners thereby providing an 8:1 turndown ratio for the overall furnace.

10. The method of claim 9 further including the step of spacing a secondary air plate a predetermined distance from the inlets to said heat exchange tubes so that a path of travel for secondary air is provided that is not parallel to an axis of an associated burner.

11. The method of claim 9 further comprising the step of providing a multispeed induced draft blower communicating with the first and second collector sections and varying its speed in accordance with the BTU output of the burners.

12. The method of claim 10 further comprising the step of adjusting the port loading of at least one group of burners so that the one group of burners can be operated at a 4:1 turndown ratio while maintaining flame stability and acceptable CO emissions.

13. A heating system comprising:

- a) at least one gas fired heating apparatus as set forth in claim 1;
- b) a second gas fired heating apparatus that includes a plurality of burners that can be operated at, at least one output rate; and,
- c) a control for coordinating the operation of said first and second heating apparatuses so that at least a 16:1 turndown ratio is achieved.

14. The heating system of claim 13 wherein said second heating apparatus can be operated at a 2:1 turndown ratio and the control coordinates the operation of the first and second heating apparatuses such that a turndown ratio of at least 32:1 is achieved.

15. The heating system of claim 13 wherein said first and second heating apparatuses comprise furnace modules adapted to heat air circulating in a duct.